

( $P < 0.05$ ). Total n-3 fatty acids constituted 1.19% in Control eggs compared with 3.12 and 3.09% in CAM-Seed and Flax-Seed eggs, respectively ( $P < 0.05$ ). The total n-6:n-3 fatty acid ratio was 5.99, 2.45 and 2.80 for Control, CAM-Seed and Flax-Seed, respectively ( $P < 0.05$ ). Camelina meal or seed could be incorporated into layer rations as a source of energy, protein and n-3 fatty acids and Camelina meal would be more efficient in incorporating n-3 fatty acids into eggs than whole seed.

**Key Words:** eggs, camelina, flax, n-3 fatty acids

#### **549 Metabolizable energy values of corn distillers grains and corn distillers grains with solubles for 6-week-old broiler chickens.**

O. Adeola and H. Zhai\*, *Purdue University, W. Lafayette, IN.*

The objective of this study was to determine the ileal digestible energy (IDE), ME, and ME<sub>n</sub> contents of corn distillers grains (DDG) and corn distillers grains with solubles (DDGS) for 6-week-old broiler chickens using multiple linear regression method. The birds were fed a standard broiler starter diet from d 1 to 21 post-hatch and a standard broiler grower diet from d 22 to d 35 post hatch. The analytical composition of DDG and DDGS used in this study were 4,879 and 4,762 kcal of gross energy/kg, 315 and 287 g of CP/kg, and 921 and 901 g DM/kg, respectively. The DDG and DDGS were incorporated into a reference diet at 3 levels (0, 300, or 600 g/kg) by replacing the energy-yielding ingredients. These 5 diets were fed to 240 male Ross 308 from d 35 to 42 post hatch with 6 birds per cage and 8 replicate cages per diet in a randomized complete block design. The inclusion of DDG or DDGS to the reference diets linearly ( $P < 0.001$ ) decreased ileal digestibility of DM and energy, total tract digestibility of DM, N, and energy, and IDE, ME and ME<sub>n</sub> in assay diets. By regressing the DDG and DDGS-associated IDE intakes in kilocalories against kilograms of intakes of DM in DDG and DDGS, the IDE regression equation was established as  $Y = -12 + 2,125 * DDG + 2,589 * DDGS$ ,  $r^2 = 0.96$ , which indicates IDE values of 2,125 kcal/kg for DDG and 2,589 kcal/kg for DDGS. Similarly, the ME regression equation was  $Y = -17 + 1,988 * DDG + 2,460 * DDGS$ ,  $r^2 = 0.97$ , which implies ME values of 1,988 kcal/kg for DDG and 2,460 kcal/kg for DDGS. For ME<sub>n</sub>, the regression equation was  $Y = -14 + 1,891 * DDG + 2,360 * DDGS$ ,  $r^2 = 0.97$ , which alludes to ME<sub>n</sub> values of 1,891 kcal/kg for DDG and 2,360 kcal/kg for DDGS. Based on these results, we calculated the advantages in IDE, ME, and ME<sub>n</sub> of DDGS over DDG used in this study to be 22%, 24%, and 25%.

**Key Words:** broiler chicken, corn distillers grains, corn distillers grains with solubles, ileal digestible energy, metabolizable energy

#### **550 Effects of the inclusion of oat hulls or sugar beet pulp in the diet on gizzard characteristics, apparent ileal digestibility of nutrients, and microbial count in the ceca in 36-day-old broilers reared on floor.**

E. Jimenez-Moreno\*, C. Romero, J. D. Berrocoso, M. Frikha, and G. G. Mateos, *University Polytechnic of Madrid, Madrid, Spain.*

The effects of the inclusion of oat hulls (OH) and sugar beet pulp (SBP) in the diet on gizzard characteristics, apparent ileal nutrient digestibility (AID), and *Clostridium perfringens*, *Enterobacteriaceae*, and *Lactobacillus* proliferation in the ceca were studied in 36 d-old broilers. There were a control diet with a low CF content (1.61%) and 2 additional diets that resulted from the dilution of this feed with 5% of either OH or SBP. Each treatment was replicated 7 times (10 chicks each) and birds were kept on pens with straw as bedding. Only one of

the chicks of each of the replicates was used for microbiology counts. Broilers fed additional fiber had heavier gizzards ( $P \leq 0.001$ ) with higher digesta contents ( $P \leq 0.001$ ) and lower pH ( $P \leq 0.01$ ) than those fed the control diet. More digesta was retained in the gizzard with SBP than with OH inclusion, a finding that was presumably related with the higher water holding and swelling capacity of the SBP. Neutral detergent fiber, acid detergent fiber, and acid detergent lignin content of gizzard digesta were increased ( $P \leq 0.001$ ) with OH but not with SBP inclusion. The AID of starch was higher ( $P = 0.05$ ) with OH than with SBP inclusion, with that of the control diet being intermediate. However, the AID of CP was not affected by diet. The inclusion of OH but not of SBP, reduced cecal counts of *Cl. perfringens* ( $P \leq 0.05$ ), *Enterobacteriaceae* ( $P \leq 0.01$ ), and *Lactobacillus* ( $P = 0.08$ ). The data suggest that the inclusion of OH, a lignified insoluble fiber source, improves gizzard function and AID of starch and reduced cecal pathogen microbial count in 36 d-old broilers. Under practical conditions, feeding OH may be used to improve nutrient digestibility and control microbial growth in the gastrointestinal tract of broilers.

**Key Words:** fiber sources, gizzard characteristics, ileal nutrient digestibility, cecal microbial count, broiler

#### **551 Effect of snack food byproduct on the feeding behavior and production parameters of laying hens.**

R. C. Van Wyhe\*, S. E. Fraley, C. Szybisty, D. M. Karcher, and E. L. Karcher, *Michigan State University.*

The increased interest in becoming 'green' for consumers and companies is driving groups to develop innovative ways to become more efficient and reduce their waste. Foods past their expiration dates are large sources of waste and are causing food-manufacturing companies to develop waste disposal strategies. Integrating by-products of these companies into animal diets, specifically that of laying hens, could be significantly more cost effective for both the human food manufacturers and the agricultural producers. The study's objective is to evaluate laying hen diets containing snack food by-product, consisting mostly of expired potato chips, and the impact on hen performance and feeding behavior. One hundred and 92 white Leghorn laying hens (45 wks old) were selected from the MSU Poultry Farm. Hens were housed in conventional cages (3 birds/cage) and received one of 4 diets for 4 wks: 1) industry standard corn-soybean meal control 2) control with 3% by-product 3) control with 6% by-product and 4) control with 9% by-product. Diets were formulated to be isocaloric, isonitrogenous, and balanced for sodium. Feed intake was measured for 3 consecutive days each wk. During the first wk, feed intake was significantly higher in birds fed the 6% and 9% diets compared with those fed control ( $P < 0.05$ ). Birds fed the 9% had a higher feed intake than control again during the fourth wk ( $P < 0.01$ ). Egg production, egg weight, and specific gravity were measured weekly. Hen body wt was measured on day one and every 2 weeks thereafter. Egg production, egg wt, specific gravity, and body weight were not significantly affected by the addition of snack food by-products to the diet. In conclusion, the addition of expired snack food by-product into poultry diets does not significantly effect laying hen egg production and has the potential to be used as an alternative feed stuff in the future.

**Key Words:** snack, egg, laying, hen

#### **552 Different levels of biodiesel glycerin in the diets of broiler chickens.**

K. C. Zavarize\*, J. F. M. Menten<sup>1</sup>, R. Pereira<sup>1</sup>, L. L. Freitas<sup>1</sup>, C. L. S. Silva<sup>1</sup>, Y. K. Carvalho<sup>2</sup>, and S. R. A. Rosa<sup>3</sup>, <sup>1</sup>University of São Paulo, Piracicaba, Sao Paulo, Brazil, <sup>2</sup>Federal University of